

CME 292: Advanced MATLAB for Scientific Computing

The goal of this 8-lecture course is to teach advanced MATLAB features, syntaxes, and toolboxes not traditionally found in an introductory course; applications will be drawn from various topics from scientific computing. Lectures will be interactive with breaks for students to write code and experiment with various MATLAB features. There will be four homework assignments that give students the opportunity to apply MATLAB concepts from lectures to applications from scientific computing. It will be assumed that students have a basic understanding of MATLAB (data types, syntaxes, workspaces, etc), CME 192 or equivalent. It is recommended (not required) that students have a basic understanding of topics from scientific computing, particularly numerical linear algebra and optimization.

Advanced MATLAB features and syntaxes to be discussed are:

- advanced graphics (advanced plotting, graphics handles/objects, publication-quality plots, animation)
- MATLAB tools (debugger, profiler)
- code optimization (vectorization, memory management)
- advanced data structures (user-defined classes)
- interfacing with external programs and files (MEX interface to C/C++/Fortran, system calls, file manipulation, communication with spreadsheets, generating stand-alone C/C++ code from MATLAB code)
- open-source MATLAB programs (MATLAB File Exchange)
- MATLAB toolboxes (Optimization, Parallel Computing, Symbolic Math, Partial Differential Equations)

Applications will be drawn from numerical linear algebra, optimization, and numerical solutions to Ordinary and Partial Differential Equations.

Students will have the opportunity to design an optional 9th lecture on MATLAB-related topics that were not covered in the first 8 lectures. Students should expect to gain:

- exposure to the tools available in the MATLAB software
- knowledge of and experience with advanced MATLAB features
- independence as a MATLAB user

Successful completion of the course requires attendance at six out of eight lectures and satisfactory submission of three out of four homework assignments.